

PRODUCT SPECIFICATION

TITLE

DATE

REV

Product Requirements

7/5/2019

2



## Product Requirements

The Beasts

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### Document History

Rev Number	Date	Modified By	Reason
0	20Jun2019	C. Douglas	Initial Formatting and Completion of Details Collected from the Customer Initial Interview Conducted with Dr. Edwin Odom.
1	24June2019	N. Brubaker	Customer Requirement Spencer updates.
2	3July2019	M.Almomen	SnapShot1 updates



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# 1 Objective

The objective of this document is to provide a clear and concise outline of quantifiable parameters so that “The Beasts” may design, produce, and validate a safe and functioning “Band Mobility Platform” that satisfies the requirements of Dr. Edwin Odom and Spencer Martin.

# 2 Scope

The scope of this document is to specify the requirements set forth by Dr. Edwin Odom and Spencer Martin to quantifiably and objectively define what constitutes a completed and fully functioning “Band Mobility Platform.”

# 3 References

## 3.1 Cited Documents

2012, UL Standard for Safety for Lithium Ion Batteries, UL 1642, 5<sup>th</sup> Ed., Underwriters Laboratories (UL), Northbrook, IL

## 3.2 Acronyms

BMP	Band Mobility Platform
C2C	Center to Center
EPO	Engineering Purchase Order
ER	Engineering Release
PCS	Power-Control System
POC	Proof of Concept
ROV	Remotely Operated Vehicle
RC	Remotely Controlled
RO	Remote Operator

## 3.3 Definitions

Band Mobility Platform	The totality of the assembly including the remotely operated vehicle and instruments.
Remotely Operated Vehicle	The assembly consisting of the stage, chassis, wheels, and PCS.
Stage	The flat surface directly bearing the load of performers and instruments.

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## 4 Functional Requirements

### 4.1 User Interface Requirements

The motion of the BMP shall be controlled via remote control by a pilot not located on the BMP.

The lights of the BMP shall be controlled by the musician located on the BMP via regular playing of the applicable instrument which activates shock activated piezoelectric sensors.

### 4.2 What it should do

The BMP should translate and rotate performing musicians about the Kibbie Dome field in a safe yet entertaining manner.

## 5 Mechanical Requirements

### 5.1 Strength Requirements

The design shall be able to support, translate, and rotate a load of 1500 lbs.

### 5.2 Spatial Requirements

The stage shall meet the following dimensional requirements:

- Length  $\leq 9$  ft
- Width  $\leq 7$  ft

The BMP shall meet the following dimensional requirements:

- Height  $< 10$  ft

### 5.3 Weight/Mass Requirements

The total system shall weigh no more than 500 lbs.

### 5.4 Mounting / Interface Requirements

The “BMP” shall have a universal mounting system to accommodate the drum set and piano with the (4) load bearing C2C points depicted to the right.

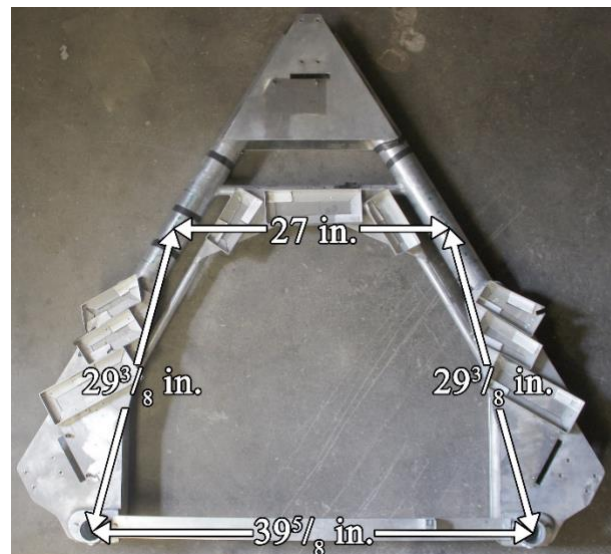


Figure 1: C2C load bearing points depicted using the previous design team's platform.



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### **5.5 Appearance Requirements**

The final product shall have lots of lights.

### **5.6 Durability Requirements**

The system shall have a lifecycle of 5 years with no component failures.

### **5.7 Reliability Requirements**

All components (bearings) shall have 90% reliability

### **5.8 Speed Requirements**

The BMP shall translate at a marching pace defined as 160 steps per minute with a stride of 23 inches. (8 steps in 5 yards)

### **5.9 Suspension Requirements**

The wheels of the BMP shall remain in contact with the Kibbie Dome field terrain and support equal loading at all times.

## **6 Electrical Requirements**

### **6.1 Operational Voltage**

During operation the voltage shall remain at 24V. The amps will be 3.2 and the resistance will be 0.089 Ohms.

### **6.2 Energy Storage Capacity**

The PCS shall be designed with a capacity to operate the entire BMP for a minimum of 15 minutes on a single charge.

## **7 Software Requirements**

### **7.1 Functionality**

The software shall be capable of receiving RC input signals from a maximum distance of 20 yards and input signals from the instrument-mounted sensors. The software shall be capable of operating relays which will distribute power from the battery bank to the PCS, motors, and lights as received by the RO and performer.



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### **7.2 User Interface**

The RO shall utilize a standard radio controller with joy sticks for controlling the left-right and forward-reverse translational movements of the BMP. The performers will control the lights via the drum set and/or the piano.

## **8 Environmental Requirements**

### **8.1 Temperature**

The Product is expected to have full operational capabilities in environments with ambient temperatures of 32°F to 100°F.

## **9 Regulatory Requirements**

### **9.1 UL Requirements**

The PCS shall comply with the UL 1642 standard for lithium batteries.

### **9.2 Shipping Requirements**

## **10 Cost Requirements**

### **10.1 Prototype Cost**

Cost to build a POC prototype shall not exceed \$1400.

## **11 Schedule Requirements**

The following are the major Project Milestones:

- |                            |               |
|----------------------------|---------------|
| - Approval of Requirements | Jun. 24, 2019 |
| - Concept Design Review    | Jul. 25, 2019 |
| - EPO of long lead parts   | Jul. 7, 2019  |
| - Detailed Design Review   | Jul. 25, 2019 |
| - ER of drawing package    | Sep. 27, 2019 |
| - Complete Prototype build | Aug. 28, 2019 |
| - Complete Build           | Oct. 21, 2019 |
| - UI Design EXPO           | Dec. 6, 2019  |
| - Final Report / Drawings  | Dec. 13, 2019 |